Building Organisational Resilience: Four Configurations

Abstract — This paper empirically explores the organisational processes at the onset of disruptions and the factors that determine different configurations of responses. It examines how processes of response, both before and in the aftermath of a disruption, support the building and development of organisational resilience. Using case study data from three UK based organisations this paper makes the following three contributions. Firstly, it identifies the common elements involved in decision-making at the onset of a disruption and explains the iterative stages and processes that lead to the development of resilience. It explains the criticality and relationships between the elements of detection, activation and response. Secondly, this paper explains why responses vary from one situation to another, by identifying two dimensions that determine the configurations of organisational resilience, namely Preparedness and Adaption. Thirdly, the paper presents the Resilience Configurations Matrix which gives rise to and establishes four distinct types of organisational configuration which are; *Process Based*, *Resourceful*, *At High Risk*, and *Resilience Focused*. The paper concludes by discussing the implications for theory and practice of resilience.

Managerial relevance statement — Resilience provides a robust approach for organisations to address and overcome sudden onset events. An important intention of this work has been to communicate to practitioners how to better adapt and prepare their organisations to any potential, unforeseen disruptive events. The study was conducted in the critical infrastructure sector of the UK power industry where effective operations management and strategy are essential. This study has produced both strategic insight and developed an operational tool to assist practitioners with their efforts. The work focused on the characteristics of organisational resilience, identifying the key process steps and features of an effective organisational response and as such would be of strong, practical relevance to operations managers looking to build practical, resilient systems. This is supported by a matrix of operational configurations of resilience. Key managerial recommendations that come out of this work are that managers looking to strengthen the

resilience of their organisation could start by exploring whether any existing processes are characterised as either rigid or agile. Recognising the features of the outlined configurations, organisations that then look to improve their resilience should start by exploring how to advance their adaptive capacity.

***Index Terms* —Resilience, Crisis Management, Decision-making, Case Study, Framework, Supply Chain, Organisations**

I. INTRODUCTION

Countries, communities, organisations and individuals are all subject to a diverse and ever-changing environment. While this environment can provide organisations with significant opportunities for success and growth, it can also present significant threats and challenges. Events, such as natural hazards, pandemic diseases, terrorist attacks, political unrest and economic instability, can all pose a significant threat to organisational performance and competitiveness. Such events may also carry dramatic implications for the wider community and region. These implications are likely to be even more profound given the increased interconnectivity of modern societies, and the inherent reliance of growing communities on critical infrastructure. As such, a major disruption involving critical infrastructure will have dramatic implications and cause potential cascading failures across wide areas [1] [2] [3].

Although a firm's outcomes may partially be dependent upon luck and causality [4], an organisation's response to a threat or disruption will depend on a variety of endogenous and exogenous factors. As a result, some are better equipped to respond to large scale events than others. For instance, the well reported differences in the responses of Nokia and Ericsson following a plant fire at one of their suppliers in Albuquerque, New Mexico, clearly indicate how different the responses of organisations can be to the same event [5] [6]. As highlighted by this and other publicised events, managing the aftermath of the event and developing an effective learning mechanism can provide an organisation with a significant competitive advantage.

In recent years, the ways organisations respond to major disruptions and disasters have received increased attention [7]. The aim of such work has been to develop appropriate knowledge and convert it into systems that enable successful responses [8]. Within this growing narrative, this paper has two aims. The first is to empirically explore the organisational processes at the onset of disruptions. The second is to explore the factors that determine different configurations of building resilience**.** Accordingly, the paper makes the following contributions. Firstly, it provides a framework that explains the processes that help establish

organisational resilience. Although generic frameworks for building resilience exist [9] [10] [11] [12], the one developed in this paper is distinct because it maps the detailed iterative decision-making processes that lead to it by focusing on organisations operating in high risk environments. Secondly, it identifies two key dimensions that determine the configuration of organisational resilience. More specifically, it finds that this depends on the organisation's abilities to adapt, i.e. to flexibly allocate resources to respond to a disruption, and to prepare, i.e. to develop a systematic approach to manage risks. The paper then identifies four distinct types of configuration which are determined by these two dimensions.

The paper is structured as follows. Section 2 reviews the literature on *resilience* and *disruptive events*. Section 3 explains the methodology and the data collection and analysis processes. Data were collected via interviews, observations, and organisational documents from three UK organisations in the energy sector. Section 4 explains the development of a framework model of resilience and provides examples of its application. The resulting framework illustrates the mechanisms of organisational resilience and highlights the phases of detection, activation and response within decision-making and organisational learning processes. The final section presents the conclusions, the implications for managers, the limitations and directions for future research.

II. Theoretical Background

Disruptive events can be both natural and man-made and are likely to have an effect on the response capacity of any effected systems [13]. Such events can vary in both severity and magnitude, causing extensive damage, economic loss, disruption, injury or in severe instances loss of life. Most severe are events, which are significant enough to challenge the existing structure, assumptions, continuity of operations, or, in extreme instances, an organisation's survival [14]. These events would thus require immediate attention and a response from an organisation for which they may not have prepared [15]. As outlined by Rosenthal and Kouzmin [16], crises are situations that threaten the high-priority goals of an effected system, and subsequently present an immediate threat to its core values and must be addressed and overcome under

conditions of deep uncertainty [2]. As such, there has been growing evidence from several large-scale incidents over the past decades [11], which has highlighted the need to develop resilience within organisational and infrastructural systems in order to comprehensively overcome complex disruptive events.

A. Organisational Resilience

The concept of resilience has undergone significant conceptual development in recent years [11] [17]. As a result, several definitions and typologies have been developed across several contexts [18], creating a diverse literature base. While the context may vary, most emphasise the dramatic implications that disruptions can carry and focus on the ability of a system to respond [17]. Within the context of an organisation, resilience is defined as the ability to anticipate, avoid and adjust to disruptions and changes [19]. This ability combines the capacity of an organisation to restore efficacy following a disruption and to develop the necessary capabilities prior to response [20].

Resilience involves the adjustment of a system following the effect of a disruption [21] and is thus affected by its ability to manage changing environmental requirements [22]. Its cultivation is a key enabler in the development of a more robust system ([11], [23], [24], [25], and [26]). The mechanisms that help build organisational resilience do so by improving situational awareness, reducing organisational vulnerabilities to systemic risk and restoring efficacy following the events of a disruption [17]. Therefore, resilience is not limited to only addressing disruptions, but extends to the ability of a system to adjust its functioning across expected and unexpected conditions [27]. As such, it leads to wider organisational dynamic capabilities that support a system's capacity to adapt to new environmental conditions and can improve other dimensions of performance, e.g. quality and delivery [28]. This capability to change has been referred to as "adaptive capacity" [29].

A system's adaptive capacity relates to its ability to respond to changing environmental conditions and is determined by its ability to change, learn [30] [31], and reconfigure its resources so as to respond to the disruption [26]. Thus, a system with higher levels of adaptive capacity will be one that is able to develop

structured and rational approaches, and to allocate resources quickly and effectively to deal with disruptive and crisis events. Organisations that foster and develop their adaptive capacity continuously develop and apply new knowledge [32] through a wide spectrum of sizes and types of disruptions. As such they are able to function across a wider range of variability.

=== INSERT Table 1 – Resilience Models and Frameworks ===

In an effort to conceptualise resilience, previous researchers have developed frameworks and guidelines which explain both how resilience is built and how it is integrated into an organisation's systems and culture. A summary of these frameworks is outlined in Table 1 which provides an overview of the various approaches to managing disruptive events. Deterministic approaches to building resilience suggest that when disruptions are relatively small and involve parameters which are understood, organisations can respond through a positive adjustment [9]. Such approaches suggest that when crises are larger and of higher impact, they can be mitigated through a more structured response [36]. This, relatively rigid, approach to managing crises suggests that organisational strategies aim at minimising the size of the disruption to render them more controllable. This response assumes that an organisation is able to accurately predict both the types of the disruptions and their impact, an assumption which, in an uncertain environment, may not hold true.

When disruptions are relatively large, however, such approaches may provide unnecessary rigidities. For instance, Ambulkar et al. [26], who focused on the supply chain level, found that rigorous crisis management plans may actually diminish an organisation's ability to allocate resources to the right place. In addition, Vargo and Seville [12] proposed a theoretical model for crisis management strategic planning by focussing on SMEs and the strategic planning requirements rather than decision making processes. They explain that this will depend on the tendency to plan and be adaptive. But identify that larger organisations are likely to be more rigid. Similarly, Olcott and Oliver [37] who explored the impact of the earthquake that hit Japan in

2011, argued that such large scale and unexpected events, for which there is no dominant response model, expose vulnerabilities which may have been hidden when crisis management plans where put together. They argued that in such cases other, softer, characteristics which may lead to flexibility may become more important. These included the sense of obligation to suppliers, customers, employees and the community more generally, and the ability to contextualise and act on the changing information they receive appropriately. In the presence of these enabling conditions the probability of a positive adjustment within overcoming the impacts of a disruption increases [9]. Therefore, by identifying and promoting these enabling characteristics, an organisation may be better placed to make decisions that not only overcome the impact of a disruption, regardless of its magnitude, but potentially transcend them to development opportunities by improving the system's adaptive capacity.

B. Disruptive Events and Decision-making

Decisions involve judgements about future states of affairs [38], and decision-making is the process of analysing information and utilising knowledge to resolve problems [39]. During periods of normal operations, organisations are better able to undertake in-depth analysis and consideration of a wide range of alternatives. Consequently, managers become relatively adept in comprehending the issues at hand, gathering pertinent information, forming judgements and developing assertive plans of action [39]. However, following a disruption, the constraints of the situation limit the ability of decision makers to apply such a rigorous process.

Disruptions require managers to make context-specific decisions quickly, often under stress and ambiguity. In such an environment, information may be incomplete or inconsistent [38] and thus it may not be possible for crisis management plans to fully guide decision making. This could be especially impactful when the disruption is of high magnitude and severity, in which case systems may lack the capability to cope with the associated complexity and uncertainty [40]. Thus, decision makers may have to make decisions without considering potentially important or critical issues [41] [42]. They would need to quickly interpret the

organisational context within which the disruption takes place, assess its potential impact and provide some direction for recovering. It would thus be reasonable to expect that decisions and actions at the onset of a disruption are dependent on a combination of implementation of crisis management plans and intuition [43]. Yet, the process of doing so on the one hand and the factors that determine it on the other are relatively poorly understood [44] [7]. To address this gap, this paper aims to empirically explore the organisational processes at the onset of disruptions and the factors that determine different configurations of building resilience.

III. Methodology

Following the onset of a disruption, managers have to make continuous judgements about its severity and potential impact on their own operations. These judgements require a context specific understanding of the event on the one hand and the possible responses on the other. Therefore, identifying the factors that determine an organisation's response to disruptions requires an in-depth investigation of the processes that lead to it. As a result, a multiple case study [45] [46], which focuses on the planned and actual responses of organisations was the most appropriate method to achieve the aims of this paper. Although this choice of method may affect the results' generalizability, it should help capture the multidimensionality and context of the complex processes associated with an organisation's response to a disruption.

Three organisations participated in this study. Their selection was based on the following two criteria. First, they needed to have some experience with disruptions and/or have developed some policies processes for crisis management. The rationale for this criterion was that when they go through this process they develop some context specific thinking behind the application of processes that help manage disruption as opposed to simply presenting a standard approach. Second, they needed to operate in high risk and demanding environments as this would provide deeper insights into the processes and reactions that would help build resilience. Organisations that meet both of the above criteria would generate the data that would provide a good fit for the research aim of this paper because the responses would explore the contextual insights of response practices and processes and, as a result, would help identify the factors that determine

the decision-making processes triggered by a disruption.

For the scope of this study, disruptions were defined as sudden onset events outside of the routine functioning of the organisation which had the potential of causing significant impact on how the organisation functions. Although, the three organisations had substantial international operations, the focus of this study was on the management of threats and disruptions to their critical infrastructure within the UK. Given the relative proximity of the researchers to these UK sites this decision ensured a good balance between richness of qualitative data and generalizability. Information about the organisations is included in Table 2.

=== INSERT Table 2 – Description of Case Study Organisations ===

Each of the case study organisations had specific experience of responding to disruptions that fell within the scope of the definition provided in this paper. They included natural hazards, regulatory changes, economic shifts and system failures. Case Organisation 1, is a global engineering organisation that provides power generation and distribution technologies. In the UK, the organisation experienced several operational incidents including a shutdown of the procurement system due to a catastrophic IT infrastructure failure. This event provided a focus for the case study as it carried impact on the entire organisational supply chain and resulted in several large-scale project delays. Case Organisation 2 is an intermediary involved in procurement and inventory management operations in the energy sector. It was involved in a significant operational incident during the transportation of hazardous material. Case Organisation 3 has substantial power generation and supply operations in the UK. Across these diverse operations, the organisation has experienced several events resulting in local and regional power failures. The causes of these events included single sub-station failures and larger events such as the heavy flooding across South West England due to severe weather. Each of these events is specific to the case organisations. While other disruptions were referred to during data collection, focus was placed on exploring the responses to these events.

A. Data Collection

Data were collected over a two-year period and included 20 semi-structured interviews (60-90 minutes long), observations, organisational publications, documented procedures, financial reports, and corporate presentations. These resulted in over 150 sources of supporting documents and evidence. The demographic details of the interview respondents are presented in Table 3.

=== INSERT Table 3 – Interview Respondents ===

The interviews, which constituted the main part of the data collection process, consisted of two parts. First, interviewees were asked to explain the formal processes they had in place to respond to disruptions and their policies for developing resilience. Second, they were asked to discuss how they thought these processes and policies worked. To make sure this led to the factors of decision-making, interviewees were asked to focus on the specific events that had triggered these processes (as explained earlier). The interviewees consisted of senior managers and organisational members linked with activities associated with crisis management. Senior managers provided an overview of the role of building resilience within the business and how such processes should work. The organisational members with roles linked with crisis management were identified after reviewing organisational charts and documented processes on responding to crises. Typically, these would include members with job titles such as operations manager, project manager, technical manager, etc.

The interview questions focused on how each organisation responded to an event and on how they were planning to approach future response activities. Interviews were guided by an interview protocol and explored the individuals' organisational background; personal experience; perceived capabilities of the organisation; the response of the organisation to disruptions; and the respondents' perceptions of issues related to resilience. Interviews were recorded and then transcribed for review and analysis. Finally, in a few instances

additional information and clarification was provided through telephone and email when some of the original information led to conflicting issues.

B. Data Analysis

To analyse the data the following four steps were followed: First a case study database was developed for each of the participating organisations [46]. This led to the development of case reports which included a review of the interview transcripts and a synthesis of supporting data sources. The reports were also shared with the participating organisations for additional validation. Second, data from the database were coded following the qualitative approach detailed by Strauss and Corbin [47], and Miles and Huberman [48].

The purpose of the coding process was to identify salient categories through constant comparison and to identify the main relationships between codes, including the contextual factors, to build an explanation of the processes that are triggered following a disruption. Examples of disruptions included instances of delayed supplier delivery, loss of key staff, equipment failure and regulatory change. The coding process began with a basic description of the main processes that were used to respond to sudden onset disruptive events. The coding process was iterative. After defining the initial codes, the data was revisited to identify themes which related to them. During subsequent iterations, they were refined and reclassified, leading to the emergence of several new codes. The new ones covered aspects of the business processes that had not been explicitly covered in the first step. Each new code was discussed amongst the researchers and a definition was agreed. This first level coding provided broad categories such as risk management, threats and disruptions, communication, flexibility and organisational capabilities. This then developed into conceptual ordering and theorising of identified features [49]. Third, the coded data was clustered into groups and themes to explore higher level concepts. Fourth, the codes were grouped and integrated to form nodes, which were later used to form a generic process of response. In order to ensure consistency and validity across the coding process, all generated codes were reviewed by two independent researchers. Case study reports were also generated for review by each organisation.

The procedures used to collect and analyse the data meet the criteria often associated with such studies [50], namely, credibility, conformability, dependability and transferability [51]. To meet the dependability and transferability criteria, several quotes and detailed information about the responses used are provided in the following sections. During data collection, the information received from the interviews was reviewed and supported with data received from other sources, i.e. minutes of meeting and organisational reports.

To ensure that previous literature informed the coding process [48], key dimensions such as adaptive capacity and adjustment, which have been used in the literature to define processes of resilience were reviewed. This review provided the initial codes which were used in the next stage of the analysis. Although the resulting list of dimensions was not exhaustive, it included the key areas that previous studies have used to define resilience [20].

The coding process was conducted by two coders to ensure reliability of the coding judgments. The level of agreement between the coders was 75% and is considered an acceptable reliability rate for this type of study [52]. The remaining 25% of differences were resolved through discussion and consensus. To ensure transferability [51], details on the context of the analysis as well as several examples of quotes that were used to describe their integration practices are provided throughout this paper. Following several iterations of this process, two contextual dimensions emerged that determined the trajectory of how the case study organisations respond to disruptions, these dimensions were named *Preparation* and *Adaption*.

The *Preparation* dimension emerged from respondent discussions about the degree to which organisational responses to events had been developed as part of detailed crisis management plans. Therefore, *Preparation* is the degree to which the organisation develops a systematic approach to manage risks and can be reactive or proactive. When reactive, the emphasis of the response is on allocating resources and improvising. When proactive, the emphasis is on the development of crisis management plans which aim at preparing the organisation for as many eventualities as possible.

The dimension of *Adaption* emerged when respondents were discussing instances where they had to react to quickly interpret the impact of the disruption, and allocate resources without relying on a pre-existing plan. Adaption, therefore, is the degree to which an organisation flexibly allocates resources that respond to a disruption and can be rigid or agile. When rigid, the response lacks flexibility, e.g. because there are no resources available, or because formalised policies and processes may limit the ability of a firm to reconfigure its resources [26]. When agile, the organisation can respond by flexibly reallocating its resources and improvising to respond to the disruption.

These two dimensions give rise to four distinct, organisational *configurations*, i.e. different combinations and degrees of *Preparation* and *Adaption* which determine how an organisation can respond to a crisis. The next section first presents and discusses the generic decision-making framework that determines how an organisation responds to a disruption. Following this, the resilience configurations are defined and discussed by using the framework to explain how decisions vary across the two dimensions of *Preparation* and *Adaption*.

IV. Organisational Response Framework and Resilience Configurations

Organisations face a diverse range of potential risks and threats; these events can carry far ranging implications both for their structure and operation. These may include physical damage, safety issues, altered management structures, restricted controls and processes, implications for associated stakeholders and future liabilities. Each event also carries the distinct possibility of escalating into a potentially high impact crisis if the organisational response is not effective. The nature and appropriateness of any response will subsequently depend on the event itself. Yet, as the analysis in this paper indicates, there are some common elements that guide an organisation's response. In the Organisational Response Framework of Figure 1, these are depicted through seven nodes and identifies two channels of response through the nodes of *Adjustment* and *Response*. Figure 1 also includes the feedback loops that potentially lead to formal and informal learning.

=== INSERT Figure 1 ===

The linkages in the model show the key factors of the management of a disruptive event and focus on the elements of resilience. It consists of four 'response' and three 'decision-making' nodes. The nodes of *Detection*, *Activation* and *Evaluation* form the central decision making processes within organisational responses. The nodes of *Detection* and *Impact Evaluation*, highlighted by the dotted area, form the initial stages of a response. This part of the process is determined by a combination of crisis management plans and the managers' own interpretation of the event. During the *Activation* node, the management team decides whether to either implement an existing response or to adjust by implementing and adopting a new one. This is then followed by the *Evaluation* of the response and a possible further readjustment. The thick black line is a feedback loop where any new information is integrated into the processes for scanning and monitoring the environment for any future disruptions. The outlined nodes are defined in Table 4.

=== INSERT Table 4 – Framework Nodes ===

The nature and complexity of disruptions often restrict, or, at the very least, limit the ability to respond simply by implementing a crisis management plan [9]. In Figure 1, the phases of *Detection* and *Activation* form the critical junction that determines the nature of the response. Although the impact of a disruption will be specific to each organisation, information utilisation and communication form the predominant determinants of the response. Decision-making during periods of adversity may be predicated on the managers' ability to effectively interpret the demands of the situation and to balance them against the capabilities and resources available. While resources support resilience, they do not guarantee it [26]. Therefore, the ability to collect, analyse, interpret and utilise information effectively forms a central mechanism in an organisation's ability to overcome the demands of complex disruptive events.

Using the Organisational Response Framework (Figure 1), the following sections explain the four configurations that emerged from combining the two dimensions; *Preparation* and *Adaption* (Figure 2). At one extreme, an organisation's response to a disruption can be reactive and rigid. This is shown as the *At high Risk* configuration in Figure 2, where the organisation may be particularly vulnerable to disruptions due to a lack of preparation and limited flexibility within responses.

=== INSERT Figure 2 ===

At the other extreme, a response can be based on a pre-developed plan and allow for sufficient flexibility and resources to adapt to any idiosyncrasies of the disruptive event. This is shown in Figure 2 as *Resilience Focused.* In *Process Based* configurations, responses result from a systematic effort to predict as many potentially disruptive events as possible and to prepare mitigation plans for them. The result in this case is a relatively rigid but well-prepared system. Finally, the *Resourceful* configuration, is representative of where focus is more on direct and immediate response activities by allocating all available resources. The following sections discuss the resilience configurations in more detail.

V. At High Risk Configuration

The *At High Risk* configurations place relatively little emphasis on developing a coherent plan or being flexible, i.e. they are rigid and reactive. Although there may be some focus on reacting to external disruptions, this is likely to be more *ad hoc* and based on the experience of individuals rather than on a more systematic approach. Thus, organisations in this quadrant will show that both dimensions of *Preparation* and *Adaption* are relatively underdeveloped. With regards to *Preparation*, *At High Risk* implies that there are few established processes in place to prepare for a disruption. In terms of *Adaption*, this would imply that there are few available resources and potentially few opportunities for the organisation to learn. Although none of the case organisations in this study currently occupied this configuration, all three organisations

described situations where they have had to react to events in conditions where there was inadequate planning and lack of flexibility.

In this configuration, the linkages between nodes in the Organisational Response Framework (Figure 1), are weak and thus the response will largely depend on individuals' ability to undertake aspects of the decision-making processes independently. In the instances where respondents related such experiences, they explicitly stated that this was a situation that they were actively trying to avoid, as discussed by Manager B from Case Organisation 1:

"… If we are better at the front end planning we wouldn't be in that position. I think that is a real strength of the company without a doubt."

Similarly, Manager C of Case Organisation 2 explained that when considering how to prepare for disruptions and their approach focused towards adaption:

"I suppose being too conservative would be. Thinking that we are alright where we are and not wanting to move forward. You always have to move forward, things always have to change."

Given the relative lack of preparedness and inability to adapt, organisations configured in this way are perceived to be at high risk. In such configurations, the links between the various nodes in the Organisational Response Framework are relatively weak. For instance, weak environmental scanning would lead to a reduced ability to detect any potential disruptions. This would then negatively affect the ability of the organisation to accurately and promptly interpret the impact of the disruption on its systems and processes, which would then have a negative impact on the organisation's ability to develop an appropriate response. *At High Risk* configurations require a significant degree of improvisation. Yet, as these are dependent on individuals, the resulting responses are likely to be *ad hoc* and of limited robustness.

VI. Process Based Configuration

Process-based are those resilience configurations which focus on the development of rigorous plans for different disruptions, i.e. they are proactive, but rigid. In this configuration, the organisation tries to predict

as many disruptions as possible and to subsequently develop detailed plans and allocate resources for dealing with them.

Process Based configurations result in the development of increasing security protocols related to external events and the close monitoring of external environments. In such cases, response activities ensure that an organisation is able to survive by overcoming the internal and external impact of disruptive events. Following the occurrence of a disruption, several formal and informal learnings occur which support organisational development and the eventual improvement of response procedures. Within the Organisational Response Framework (Figure 1), these are captured in the evaluation node. In the Process Based configuration these learnings are formal and support the active development of an organisation's adaptive capacity and capabilities, e.g. through the introduction of a new process. This learning actively supports the development of organisational attributes and capabilities which determine the response of the organisation to potential larger scale events. Therefore, the loop in Figure 1, which connects evaluation to environmental scanning nodes, is strengthened and learning is achieved.

A. Preparation

Configurations in this quadrant of the Resilience Configuration Matrix focus on the development of proactive approaches by continually developing an in-depth operational understanding of dependencies and criticalities.

As explained by Manager I in Case Organisation 2:

"Operationally there could be accidents, emergencies or even terrorist activity that we would need to respond to. And in those dramatic circumstances we would need to look at what to do to protect the individuals, the driver for example, the integrity of the load, recovering the trailer or the unit."

This was central within the response activities of Case Organisation 2. Detection of any potentially disruptive event is achieved through a continual information exchange across the organisation and its supply chain network. Therefore, greater emphasis is given on detection and impact evaluation nodes of Figure 1.

The continual monitoring of environmental fluctuations allows the organisation to adapt its operations effectively through an active situational awareness process (environmental scanning node in Figure 1). Subsequently, there is a continual exchange of information, expertise and resources between various levels of the organisation and its business units. A challenge within this configuration is then establishing a process to manage and support this exchange. The organisation must continually review information across a variety of sources.

As illustrated by manager C of Case Organisation 2:

"I think what we do well as a business is looking internally and externally at each event and constantly review what we do. It is more about making sure that you keep an eye on the changing landscape of risk management and looking at some best practices, and what good companies are doing and see whether there is something that we can do stay ahead of the curve."

Actively seeking and exchanging information is closely linked to the formation and development of the organisation's strategy. In addition to identifying any potential external threats, environmental scanning allows the identification of any opportunities that may accrue from the disruption. This approach to situational awareness forms a large component within Case Organisation 2's decision-making processes. The organisation is also closely involved and aligned with various industry bodies and regulators, providing it with an early awareness of any changes within the industry regulatory frameworks and legislation.

B. Adaption

In relation to the response to disruptions, configurations in this quadrant focus on developing operational contingencies. However, these tend to be informal and are dependent on the managers' evaluation of the organisation's risk tolerances. As a result, the decision-making is often dependent on individual managers. This allows the organisation to quickly select between any trade-offs between the different options and to appreciate the consequences quickly.

As illustrated by manager D of Case Organisation 2:

"It's [the organisation's approach] to ensure that we understand the types of risks that the business faces and that we understand our risk appetite. And then we put in a series of controls that can control those risks and the thresholds of the risk that we assign. It is very much from developing the strategic intent for the businesses."

When responding to operational incidents (e.g. physical events), configurations in this quadrant require the close link with third party responders and organisations. For instance, due to the broad scope of Case Organisation 2's operations, there was little scope for directly coordinating a response to operational incidents. As a result, the preparations related to operational incidents in figure 1 focus on ensuring that they can support any response activities of responders, e.g. the fire service. These preparations focus on providing accurate and pertinent information about the materials and products involved as well as providing an interface for stakeholders.

VII. Resourceful Configuration

Resourceful are those resilience configurations which focus on the development of processes which are sufficiently flexible to deal with unexpected disruptions, i.e. they are agile, but reactive. In contrast to the process based configurations, which are relatively rigid, the aim here is to ensure that there is enough flexibility in the organisational systems to deal with any unexpected disruptions and allocate resources accordingly. More emphasis is thus placed on flexibility and less on prediction and planning.

In the *Resourceful* configuration, feedback loops that lead to learning are likely to be informal and to indirectly support organisational development, e.g. through the accumulation of tacit knowledge. In these configurations, the process of *Detection*, in Figure 1 of the Organisational Response Framework, forms the initial decision-making stage for establishing the level of response required. The linkages between *Impact Evaluation* and *Activation* then operationalise this through either formal *Response* or *Adjustment* activities. In both cases, the actual occurrence of a disruption provides a means to validate prior preparations and

procedures. As a result, past experiences of threats and disruptions aid in the development of a more resilient organisation.

A. Preparation

Resilience configurations of this quadrant aim to respond quickly and effectively to threats and disruptions. In the case organisations, this was achieved by the implementation of a system for monitoring the internal and external operating environments. The system was also used for recognising the factors or events that may impinge on the future performance of any business units or functions. As explained by Manager A of Case Organisation 3, the approach is based on establishing defined controls.

"It's to ensure that we understand the types of risks that the business faces and that we understand our risk appetite. And then we put in a series of controls that can control those risks and the thresholds of the risk that we assign."

Case Organisation 3 provided several examples of the application of such a system which was used to interpret the results of the Environmental scanning node in Figure 1. For example, recognising fluctuations in output from electrical power sub-stations. This has been achieved by the development of an in-depth operational and organisational understanding of its tolerances, i.e. the parameters within which it operates with little issue. This has then been documented and integrated into its daily procedures and forms the basis for all response activities and decision-making processes. Fluctuations affecting performance can then be recognised and evaluated (impact evaluation node) before they escalate. When these do not operate within the predetermined bounds a suitable response is activated. Therefore, as explained by Manager B and Manager A of organisation 3, the focus is not so much on preparing for every eventuality, but on quickly detecting any emerging issues that could escalate into a disruption.

Manager B of Case Organisation 3:

"Loss of a facility could be loss of water, loss of sanitation, loss of power, loss of access, fire, there are loads of different events that could ultimately lead up to the loss of a facility so locally we build round that and then the escalation points."

Manager A of Case Organisation 3:

"Other threats that have affected many organisations worldwide, for example, industrial action, adverse weather conditions, volcanic ash disruption and the fuel crisis all share similar impacts. The key for us is a flexible, simple, effective, worst-case scenario plan."

B. Adaption

The critical focus for organisations that fall in this quadrant of the Resilience Configuration Matrix is to quickly adapt their processes in the emerging context following a disruption and to allocate appropriate resources promptly. This involves the assessment and evaluation of the event's potential impact and swiftly identifying and evaluating the organisational elements that have been affected. Organisations can then establish the strategic importance of the affected elements followed by the development of a suitable response strategy. To prevent the event from escalating into a large-scale crisis, significant effort is placed on the speed of response activities.

As discussed by Manager B:

"... But fundamentally it boils down to if there is an incident that all our critical processes, that have defined our time parameters, have been able to be up and running and not breached and they are able to continue their business."

Different organisational elements become involved depending on the severity of the event. For instance, in Case Organisation 3, smaller events are managed locally, while events posing a significant threat are managed by a specialised crisis management team. Although the criteria for the classification of events and the responsibility of different organisational elements are outlined in the organisation's business continuity planning and emergency response procedures, the successful response to a disruption is by the effectiveness

of the leadership. As was explained by one of the managers of Case Organisation 3, it is the connection with the regional management structure and wider network that ensures that responses become effective.

Manager B of Case Organisation 3:

"And very often tipping point from going from incident to crisis for an organisation can be that communication period. And even after an incident does go into crisis for whatever reason the key element of that is how the organisation communicates that both internally and externally as well."

The primary mechanism of coordination during a response to a disruption includes established and formalised communication networks. Transparency in communication means that information can be transferred across the organisation openly. Decision makers are then better positioned to identify information sources, review relevant data and form a response strategy. This creates and promotes awareness and allows for resources to be effectively allocated and transferred.

VIII. Resilience Focused Configuration

Resilience Focused are those configurations which combine adaption with preparation, i.e. they are proactive and agile. Here the focus is on both developing detailed plans for predicted disruptions, but at the same time ensuring that the right skills and resources are in place to deal with the unexpected. Emphasis is thus placed on developing systems and processes for learning and prediction.

A. Preparation

Resilience configurations that fall in this quadrant are dependent on the embedded processes, procedures and structures developed to prepare the organisation to respond with specific yet flexible plans. This iterative approach focuses on actively anticipating potential disruptions, risks, and threats, and then developing the

necessary attributes and capabilities for dealing with their effects. This creates a continually evolving understanding and evaluation of the organisation's operating environment.

As explained by manager A from Case Organisation 1:

"So what controls we [the organisation] have against risk, and that is across every business unit, across every division, across the UK? This is a direct comparison between the risks to that business unit against the controls that they have in place."

Resilience results from the ability to mobilise resources quickly and effectively following the onset of a disruption. The response of an organisation to a disruption is thus dependent on the effective and prompt interpretation of environmental cues which signal that something is wrong.

As explained by Manager A from Case Organisation 1:

"Each event carries the distinct possibility of escalating into a potential crisis if the appropriate response is not followed."

It is therefore, the quick running of the process in figure 1, from environment scanning to response development that differentiates this configuration from others. During the interviews, several examples were shared where the relevant individuals were able to detect something quickly. Adaptive capacity is thereby achieved through fostering established links between organisational development, organisational competencies, and effective integration of environmental scanning and monitoring processes.

B. Adaption

Resilience configurations in this quadrant also make the organisation better able to respond to disruptive events by combining the competencies of individuals. A comprehensive response to a disruption requires first accessing the individuals with the required knowledge and expertise and then linking them with the particular event or management team. This approach requires the interpretation of demands and implications during periods of disruption.

As explained by operations Manager B of Case Organisation 1:

"It is the close connection to [business units] and having those experts in the business… If we have a fire out of hours there will be someone in group who can manage that incident and they can then push the button that initiates the group crisis team and bring them together to manage that event."

Within Case Organisation 1, a response to the management of disruptive events is determined by the effective utilisation of human resources and pre-agreed decision-making channels. It is, therefore, the collective capabilities of employees that enable the organisation to respond effectively and adapt to any disruption and to ensure the efficient operation of the process of figure 1. This requires an open organisational culture where employees are willing to accept change and thus improve the ability of the organisation to address any novel aspects of a disruption.

IX. Discussion and Conclusion

The aims of this study were to empirically explore the organisational processes of response at the onset of disruptions and to identify the factors that determine different configurations of building resilience. In terms of the first aim, the analysis of qualitative data from three case studies indicates that the process of responding to sudden onset events, depicted in Figure 1, is iterative and consists of four 'response' and three 'decision-making' nodes. The ways through which this response process will be applied will depend on the event itself, and on the organisation's ability to collect, analyse, interpret and utilise information effectively.

With regards to the second aim, an organisation's response to an event and therefore its resilience, is dependent on the degree of preparation and adaption, as depicted in Figure 2. These two dimensions give rise to four distinct resilience *configurations*, namely, *At High Risk*, *Process Based*, *Resourceful*, and *Resilience Focused*. The *At High Risk* configuration relates to situations where organisations lack preparation, and are not sufficiently flexible to respond. It extends the idea of 'maladaptive' processes such as threat-rigidity that Sutcliffe and Vogus [9] postulated as barriers to resilience. This problem of rigidity (along with the threat) is one that is also evidenced in the *Process Based* configuration where there is a relatively high degree of proactive preparation, but the system remains rigid. In this configuration,

organisations prepare for a range of possible disruptive events, but also cultivate the ability to learn and implement new processes. *Resourceful* relates to configurations where the organisation reacts to disruptions, but where there is a high degree of agility, e.g. few contingencies but many available resources. In this approach, an organisation focuses on the effective utilisation of available resources and expertise within response activities. This results in improvisation and the development of novel approaches when addressing the impact and implications of an event. This configuration supports the notion that a key feature of resilience lies in an organisations capacity to adapt [35], and extends it by arguing that to be agile there is a need to improvise. The fourth configuration, *Resilience Focused,* describes combinations where the organisation achieves a good balance between proactive planning and agility. This empirical finding of 'balance' within the *Resilience Focused* configuration, echoes the 'balance' of vulnerabilities and capabilities that Pettit *et al* [34] suggested. The findings of this study highlight that within this configuration, focus must be placed on developing both robust planning for expected disruptions and allocating resources towards overcoming the unexpected.

An important point is that it was not within the scope of this study to rank the resilience configurations in terms of effectiveness. Although the *At High Risk* quadrant is clearly an undesired state, the alternative approaches all carry some limitations as well. For instance, a high degree of preparedness, present in *Process Based* configurations will lead to the generation of several contingencies, where not all possible eventualities will have been captured. Configurations following an agile approach, such as *Resourceful*, will be well adaptable to many situations by improvising, but will require a significantly higher level of resources. Finally, a *Resilience Focused* configuration is seemingly the best to be in but, given that resources are not unlimited, there will be trade-offs between flexibilities and the development of contingencies.

Therefore, the results of this study explain how key decisions are made as part of developing organisational resilience, particularly in organisations where failure is not an option. Taking a proactive approach towards the management of disruptions requires an astute situational awareness of both the internal and external

influencing factors. Recognising changes or fluctuations within the operating environment enables an agile approach. The organisation then becomes better able to adapt its operations and minimise the impact of disruption. A detailed awareness of the operations, structure and available resources thereby provides managers with an understanding of the available organisational capabilities as well as the means of identifying or assessing the potential impacts of a disruption.

Identifying the right resilience configuration is part of the strategic positioning of an organisation relative to the demands of its operating environment. Yet, decision-making during a response is undertaken primarily at an operational level. As a result, managers try to balance the desire to implement a crisis management plan with the urge to improvise and allocate resources quickly. While organisations may take a strategic approach, the imposed demands and constraints following the onset of a disruption mean that they need to manage each phase during the escalation or development of a disruption. However, as illustrated in the Organisational Response Framework (Figure 1), this is not a linear process. Disruptions create complex environments for decision-making which may constrain a manager's ability to identify their long-term impact. Subsequently, there are different pathways that can be pursued following the activation of a response. This creates a distinction between Adjustment and Response in Figure 1. Adjustment is the change to organisational functions as the result of a disruption and Response is the mitigation of a disruption's impacts.

Decision-making following a disruption is steeped in ambiguity, characterised by both risk and uncertainty [38]. The elements that constitute a successful decision are often unclear and depend on the specific element, individual and situation. This research has provided new insights into the previously unseen process [53] of how resilience related decisions flow within organisations [54]. In doing so it has progressed some way towards addressing a key research question raised in recent work by Linnenluecke [7], i.e. what type of resilience approach is most beneficial to firms? The four configurations presented here establish that responses will vary according to the degrees to which an organisation has prepared, e.g. by developing detailed crisis management plans and is able to adapt, e.g. by reallocating resources quickly after a disruption.

Therefore, the type of configuration which is more appropriate is path dependent and not necessarily dependent on the size of the disruption, as some previous research has suggested [26]. Although intuition would suggest that the *At High Risk* configuration is undesirable and the *Resilience Focused* configuration is the most advantageous situation to cultivate, the findings of this study illustrate that there is no one best configuration suited to every contextual situation. A disruption in two outwardly similar organisations may trigger different responses depending on the specific resilience configuration. Therefore, due to the challenges of decision making under these circumstances, organisations may pursue different paths to dealing with the same situation.

In summary, this research differs from previous work (Table 1) in that no previous work has studied the detailed resilience-related processes within organisational responses, additionally previous work has been largely conceptual in nature. The findings of this work provide important insights for organisations as the research unravels the decision processes in infrastructurally important organisations along with lessons for practitioners. As a result, this study establishes a new, empirically-founded framework which explains how organisations may occupy one of four different configurations for building resilience, dependent upon the degree of their orientation towards Adaption and Preparation.

A. Managerial Implications

Using the Organisational Response Framework (Figure 1) and the Resilience Configuration Matrix (Figure 2), the following recommendations are made to managers looking to prepare their organisations' response capabilities. The first relates to the positioning of the organisation in terms of preparedness and adaption. Managers looking to strengthen the resilience of their organisation could start by exploring whether any existing processes are rigid or flexible. This could then help them develop resilience strategies which are more appropriate to their organisations, e.g. an organisation which identifies with the *Process Based* quadrant will most probably benefit from exploring how its current processes can deal with any emergent eventualities, whereas one that identifies with the *Resourceful* configuration would need to explore how the associated

flexibility can be enhanced.

A second recommendation accrues from the Organisational Response Framework (Figure 1). Organisations that look to improve their resilience should start by exploring how to advance their adaptive capacity. This could involve the proactive engagement with environmental scanning and monitoring activities as this will support the development of situational awareness and eventually allows a continual exchange and review of information from across organisational networks.

B. Future Directions

Future researchers could concentrate their attention on both the strategic implications of resilience in relation to the performance of an organisation and the mechanisms that support the adaption of an organisation during periods of adversity. As such, the discussion of enabling conditions, positive adjustment, emergent organisational systems and their related capabilities raises some parallels with the resource-based view (RBV) [55] [56] [57] and dynamic capabilities [58] [59] [60], along with contingency theory [61]. In this regard, the nature of resilience may have closer parallels with organisations that choose to operate within 'high-velocity' [62] or 'hyper-competitive environments' [63]. By aligning the findings of this paper with these theoretical frameworks, future research can begin to better address the complexity associated with disruptive events and support the development of organisational resilience.

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Table 1 – Resilience Models and Frameworks

Framework/Main Finding	Theoretical /Empirical	Theory	Authors/s
Understanding and overcoming barriers to organisational adaptability	Theoretical	The maintenance of positive adjustment under challenging conditions dependent on organisational structures and controls	Sutcliffe & Vogus, 2003 [9]
Seminal work setting key criteria for supply chain resilience	Theoretical	Spreading risk, redundancy, agility in a supply chain context	Christopher & Peck, 2004 [33]
Redundancy vs. flexibility in a supply chains	Theoretical	Improving flexibility instead of redundancy in a supply chain context	Sheffi & Rice, 2005 [10]
Supply chain resilience – balancing forces of change against management controls	Theoretical	A portfolio of balanced resilience is dependent on developing capabilities and reducing vulnerabilities	Pettit et al, 2010 [34]

Simple descriptions of 6 different models of resilience from different viewpoints	Theoretical	Practitioner focused work derived from common themes in different disciplines	Gibson & Tarrant, 2010 [11]
Model for crisis strategic planning	Theoretical with case example	Type of resilience achieved depending on approach to crisis strategic planning	Vargo & Seville, 2011 [12]

Table 2 – Description of Case Study Organisations

	Case Organisation 1	**Case Organisation 2**	**Case Organisation 3**
Main business	Energy Operator	Intermediary Supplier	Energy Producer
Sector	Engineering and Technology	Energy/Materials	Energy
Market	Global	European/Global	Global
Number of Interviews	6	8	6
Average Interview length	55 minutes	65 minutes	60 minutes
Average Transcript Length	5977 words	6561 words	6184 words
Supporting Data Sources and Articles	60 Sources	30 Sources	65 Sources

Table 3 – Interview Respondents

	Position	Tenure
	Case Organisation 1	
Manager A	Sustainability Coordinator	15+ years
Manager B	Division Secretary	10+ years
Manager C	Division Head	15+ years
Manager D	Supply Chain Manager	10+ years
Manager E	Division Head	10+ years
Manager F	Security Manager	10+ years
	Case Organisation 2	
Manager A	Managing Director	20+ years
Manager B	Commercial Manager	10+ years
Manager C	Quality Manager	10+ years
Manager D	Logistics Manager	10+ years
Manager E	Business Development	5+ years
Manager F	Operations Manager	15+ years

Manager G	Logistics Manager	5+ years
Manager H	Security Manager	15+ years
	Case Organisation 3	
Manager A	Division Head	10+ years
Manager B	Quality Manager	10+ years
Manager C	Security Manager	10+ years
Manager D	Operations Manager	5+years
Manager E	Operations Manager	5+ years
Manager F	Division Secretary	15+ years

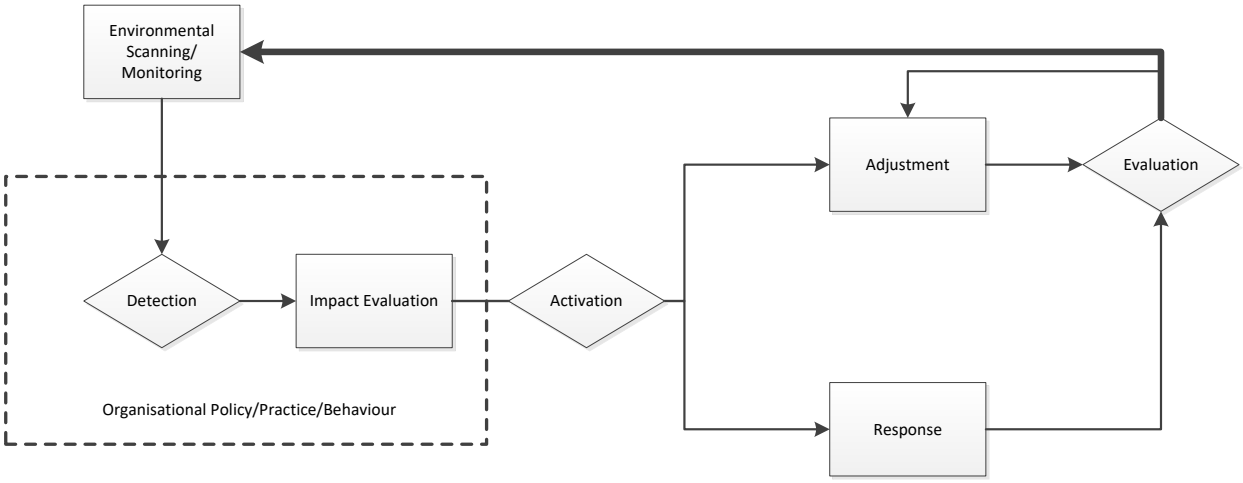

Figure 1 – Organisational Response Framework

Table 4 – Framework Nodes

Node/Variable	Description
Detection	The active process through which the determinants or impacts of an event are recognised. This process forms the initial decision-making function within response activities.
Impact Evaluation	Assessment of the initial impact and implications of an event or incident as defined by organisational policies and procedures. Deciding on the resources needed to implement the response plan.
Activation	The process forming the initial stages of response. Elements begin to deploy response protocols and available resources within the organisational system.
Adjustment	The alteration in or change to organisational functions or processes in response to an event or threat.
Response	The behaviour due to an internal or external stimulus. The focused mitigation of an event's impacts.
Evaluation	The result of response and adjustment activities.
Organisational Development	The implementation of learning and improvement following the response of an organisation.
Environmental Scanning/Monitoring	Process through which an organisation monitors both the internal and external environment.

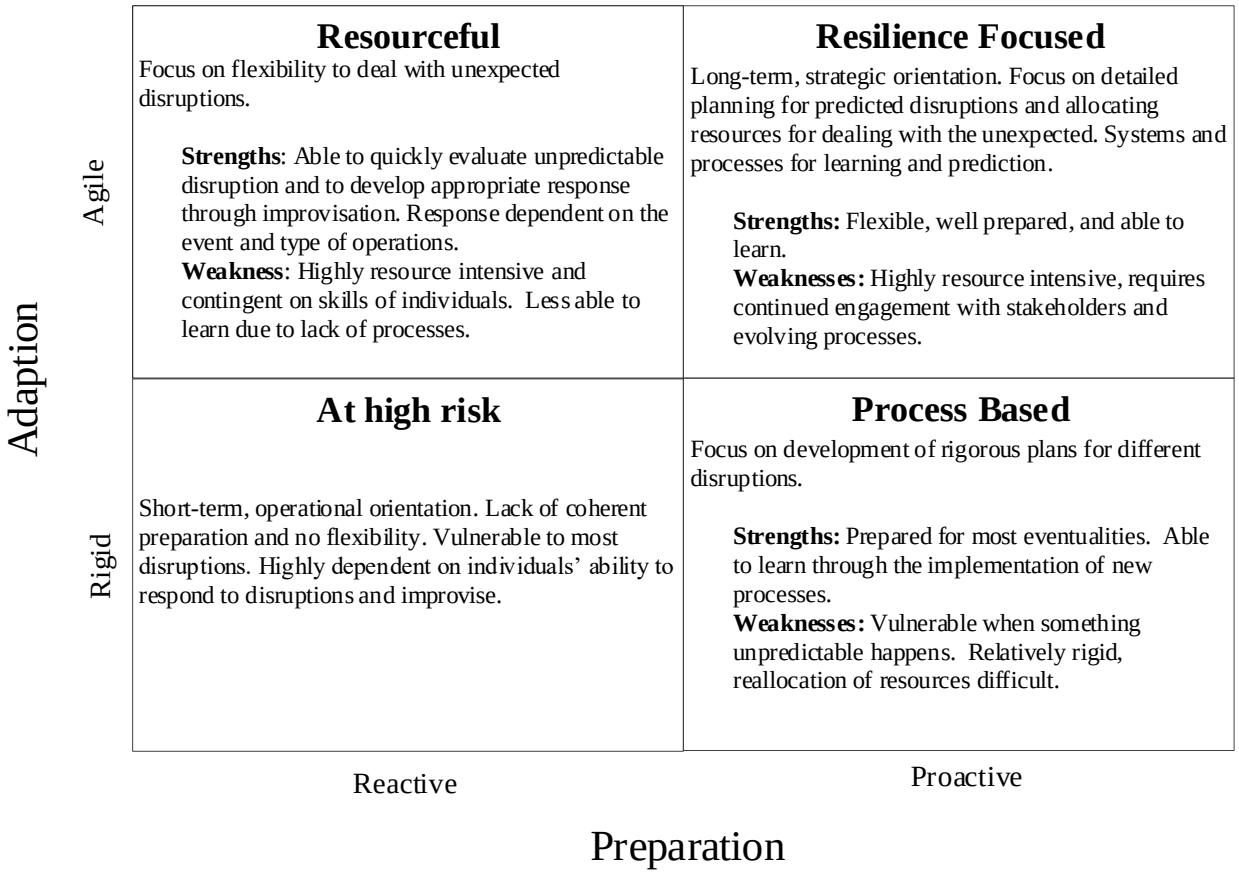

Figure 2 – Resilience Configurations Matrix